

**ENGINEERS AUSTRALIA**  
**Western Australia Division**



**CEREMONY REPORT**

***STIRLING BRIDGE***



**Heritage Recognition Ceremony**

**Stirling Bridge, December 2, 2014**

**PREPARED BY ENGINEERING HERITAGE WESTERN AUSTRALIA**  
**March 2015**

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*Cover page photo Anthony Riddette*

## 1. INTRODUCTION

The Stirling Bridge at Fremantle was planned to meet the traffic requirements generated by the continuing development of heavy industry in the Kwinana area and general urban expansion. The bridge has been planned by Main Roads WA to be duplicated in the future and the first stage was completed in 1974, three months ahead of schedule. It was designed by Maunsell and Partners and constructed by Clough and Son Pty Ltd. It was officially opened by the Premier of Western Australia, the Hon Sir Charles Court, on May 17, 1974. At the time of its opening it was the longest bridge in Western Australia.



Figure 1. The interpretation panel and marker in place on the south shore of the Swan River (Photo Karen Riddette)

## 2. CEREMONY

The Stirling Bridge celebration was the 189<sup>th</sup> in Engineering Heritage Australia's Heritage Recognition program.

Due to budget restrictions the MRWA was unable to host a formal ceremony to commemorate the Engineering Heritage Marker award to the Stirling Bridge. However MRWA did cover the cost of the design, manufacture, delivery and installation of the panel and had no objection to EHWA holding an informal ceremony which took place on December 2, 2014.

EHWA invited staff members of MRWA, Maunsell, Clough and the major subcontractor, BBR Prestressing, with partners, who had been involved in the planning, design or construction, to attend the ceremony and a list of invitees and attendees is attached (see Appendix 1). EHWA Chair Professor Mark Bush and EHWA panel member, Karen Riddette, who had been involved in the preparation of the nomination, also attended (Figure 2).

The interpretation panel was jointly unveiled by Geoffrey Fernie and Peter Knight, respectively Maunsell Lead Designer and Clough Site Construction Manager (Figure 3).



Figure 2. Ceremony attendees (L to R) Mark Bush, Karen Riddette, Leith Young, Don Young, Glen Knight, Peter Knight, Harold Clough, Bob Freedman, Audrey Saunders, Ken Michael, Peter Saunders, Lee Fernie, Jim Leslie, Geoff Fernie. (Photo Peter Fairweather)





Figure 3. Peter Knight and Geoff Fernie unveil the interpretation panel.  
 (L to R) Glen Knight, Peter Knight, Geoff Fernie, Lee Fernie  
 (Photos Peter Fairweather)

### 3. COSTING

ITEM	BUDGET	FUNDED BY
Panel Design	\$282.00	MRWA
Panel/Frame Manufacture	\$2,508.00	MRWA
Panel Delivery	\$132.00	MRWA
Panel Install Costs	N/A	MRWA
Marker	\$200.00 approx	EHA
Ceremony Costs	-	-
<b>TOTAL COST (known amounts):</b>	<b>\$3122.00</b>	

### 4. INTERPRETATION PANEL

The interpretation panel design is shown in Appendix 2. The panel is vitreous glass enamel, 1200 mm wide by 600 mm high. It is fixed to a powder coated galvanised frame and the standard 300 mm diameter EHM marker is bolted to a 3 mm steel plate spanning between the legs of the frame. The panel is installed near the south abutment of the bridge, between the riverside road and the shoreline. See Figs 4 and 5.

## APPENDIX 1: INVITED GUESTS AND ATTENDEES

Name	Organisation / Role	Attended	Apology
Dr K C Michael	Commissioner for Main Roads WA, 1991 - 1997	•	
Mr A H Tognolini	“ “ , 1985 - 1990		•
Mr J G Marsh	Bridge Engineer Main Roads WA, 1957 - 1985		•
Mr P Saunders Mrs A Saunders	Site Civil Engineer MRWA	•	
Mr P G Sands	Manager Perth Office Maunsell & Partners, 1970 - 1975		•
Mr G N Fernie Mrs L Fernie Mr P Fairweather	Lead Design Engineer Maunsell & Partners	•	
Mr J Leslie	Maunsell Partners Perth Office Engineer 1972	•	
Dr W H Clough	Managing Director & Chairman J O Clough to 2002	•	
Mr D F Young Mrs L Young	Clough Stirling Bridge Project Director 1972 – 1974	•	
Mr P J Knight Mrs G Knight	Clough Stirling Bridge Construction Manager 1972 – 1974	•	
Mr E C Wells	Clough Chief Structural Design Engineer		•
Mr R Browning	Clough Site Civil Engineer		•
Mr J Bromell	Clough Site Civil Engineer		•
Mr R Freedman	Manager BBR Prestressing Company	•	
Mr J Calder	Clough Precast Yard Superintendent		•
Mr W Romaro	Clough Site Superintendent		•
Prof. Mark Bush	Chair, EHWA	•	
Mrs Karen Riddette	EHWA panel member	•	






# STIRLING BRIDGE

## - AN ELEGANT SOLUTION -



**A NEW CROSSING FOR THE SWAN RIVER**

A bridge over the river at Fremantle has always been a key focus of interest since the Western Australian colony was established in 1829.

When completed in 1974 the Stirling Bridge, named after the colony's first Governor, Captain James Stirling, was the latest structure to span the river. It was designed to provide a link between Stirling Highway and Cockburn Road, and to meet the traffic requirements generated by the continuing development of heavy industry in the Kwinana area and to provide a bypass to the City of Fremantle.

**AN AESTHETIC DESIGN**

Main Roads WA appointed Marnsall and Partners to design and supervise the construction of the bridge. The accepted solution was a seven span, twin post-tensioned segmental spine concrete structure with an overall length of 415 metres.

Marnsall took into account the beauty of the site and they succeeded in designing a bridge which sits gracefully in its environment displaying the structure from a high vantage point. The bridge is a masterpiece of engineering, a mixture of 3.4 metres at the south abutment to a minimum of 1.8 metres at the north abutment complements the reduction in span lengths and soffit clearance height from south to north, producing a pleasing appearance, particularly when viewed in elevation.

The architectural shape of the pier columns was designed to provide a changing contrast from light to shade as the sun moves across the sky.



Stage 1 construction, showing completed upstream row and temporary piers supporting the falsework truss and placing gantry. The downstream row is nearing completion.




The crane barge used to drive piles and transport the steel falsework.

Column formwork ready to pour the concrete.

Each concrete beam unit is slightly offset from the previous unit used to ensure all 292 units were accurately cast.

Gantry crane placing a concrete beam unit onto falsework.

**CONSTRUCTING THE BRIDGE**

Tenders were called for the construction of the bridge in early 1972. The lowest tender of \$2,580,000, submitted by Perth firm J O Cough and Son Pty Ltd, was accepted on 12 June 1972, with a required completion date of 14 July 1974.

The 74 permanent tubular steel pier support piles were driven to depths up to 51 metres using a crane barge equipped with diesel pile driving hammers. Temporary piles were also driven to support the formwork for the permanent concrete pile caps and the three half-span steel falsework trusses. Concrete was formed from a temporary jetty on the south shore in a tibble which was then filled by the crane and placed in the pile caps and columns.

The superstructure of a post tensioned concrete bridge consists of precast concrete units. In this case 2.97 m long, erected and accurately aligned and levelled on a supporting structure known as falsework. The 75 mm joints between individual units were then filled with a high quality concrete. High strength concrete was used for the pile caps and columns. The concrete for the pier concrete had reached sufficient strength a jacking force is then applied to the cables at the ends of a stage of units which causes them to become self supporting and the falsework could then be removed and used in a later stage.

There were five stages of construction, each consisting of an upstream row and a downstream row. The upstream row was constructed first, and after completion, the falsework lowered and moved sideways to support the units for the downstream row. The respective stages for each row were joined at the quarter points of the spans by connecting the rear ends of the cables for the row under construction with the front ends of the previously completed row.

The 292 individual beam units which made up the superstructure were precast at Cough's concrete casting yard at Kwinana, then transported 24 kms by low loader to the site. A purpose built gantry crane unloaded the units onto a rail mounted transporter, which conveyed them over the previously completed deck to the placing gantry which lowered them on to the falsework.



The bridge was constructed in five stages working from south to north.

For more details of this and other engineering heritage awards, go to [www.engineeringheritage.com.au](http://www.engineeringheritage.com.au)

### BASIC DATA

- Length: 415m  
Width: 16.4m  
Min. clearance: 9m  
Max. pile depth: 51m
- Materials and labour required:**
- 925 cubic metres of concrete
  - 1,110 tonnes of reinforcing steel
  - 285 tonnes of high-tensile steel cable
  - 95 tubular steel piles
  - 347,000 labour hours

### OFFICIAL OPENING

The bridge was completed three months ahead of schedule and was officially opened to traffic by the Premier of Western Australia Hon Sir Charles Court, OBE, MLA on 17 May 1974. At the time of its construction it was the longest bridge in Western Australia.

Sir Charles Court officially opening Stirling Bridge, assisted by Mr Don Aitken



### EMINENT PERSONS



**Fernie**  
Eminent Western Australians associated with the planning, design and construction of the bridge included Sir Charles Court, Premier of Western Australia, Mr Don Aitken, Commissioner of Main Roads WA, Mr Gilbert Marsh, Bridge Engineer Main Roads WA, Mr Geoffrey Fernie, Marnsall and Partners Bridge Design and Resident Engineer, Mr Harold Cough, Managing Director J O Cough and Son Pty Ltd, Mr Don Young, Cough Project Director and Mr Peter Knight, Cough Site Construction Manager.

An Engineering Heritage Marker was awarded to Main Roads WA on 19 August 2014.

Engineers Australia acknowledges the assistance given by Main Roads WA in producing this interpretation panel. Historical photographs courtesy of Cough and Son, Main Roads WA and the State Library of WA.

